

# Traffic and Accident Conditions

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## Existing Roadway Traffic Volumes

The proposed trail will include four roadway grade crossings and one railroad grade crossing. The roadway crossings are proposed where the existing railroad right-of-way intersects Commonwealth Avenue, at the south side of the MCI facility; Main Street at Commonwealth Avenue in West Concord center; Old Marlboro Road near Cottage Street and Williams Road at Old Marlboro Road. The rail crossing is located at the West Concord MBTA Commuter Rail Station and is currently used by MBTA patrons.

MassHighway record information lists traffic volumes for Commonwealth Avenue (near Main Street), Main Street, Williams Road and North Road (Route 117). Additional traffic volume counts were conducted on weekday and weekends by the Concord Police Department on Commonwealth Avenue near the Correctional Facility and on Old Marlboro Road, Powder Mill Road and Williams Road. The traffic volume counts are included in Appendix to this report and summarized as follows:

	Daily Volumes
Commonwealth Avenue, near Main Street	9,000
Main Street, near Commonwealth Avenue	11,100
Williams Road, near Old Marlborough Road	3,000
North Road (Route 117), Sudbury	11,700

It is noted that the only roadway crossing that has traffic volumes exceeding 10,000 vehicles per day is the Commonwealth Avenue/Main Street intersection which is currently signalized.

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## Crash Data

Crash data was obtained from MassHighway for a three-year period, from 2003 to 2005. Twenty-two (22) incidents involving collisions between a motor vehicle and a pedestrian or a cyclist were reported town wide during this period. None of the crashes resulted in a fatality. Three of the incidents occurred within the project area (within ¼ mile of the corridor or a potential alternate route). The details of those crashes are listed below.

## 2003

- A vehicle traveling westbound on Main Street at Commonwealth Avenue struck a pedestrian. No injuries were reported.

## 2004

- A vehicle traveling eastbound on Main Street at Church Street struck and injured a pedestrian.

## 2005

- A vehicle traveling eastbound on the Fitchburg Turnpike (Route 117) at Sudbury Road struck and injured a pedestrian.

The Concord Police Department reported no recorded accidents within the project limits from 2005 through 2007.

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## Estimate of Trail Use Volumes

Many residents expressed concern about the number of pedestrians and bicyclists that would utilize the trail. Numerous comments referenced the volumes on the Minuteman Bikepath which some sources claim has two million visitors per year. Many residents feared that the Bruce Freeman Rail Trail (BFRT) would generate similar volumes.

The original 1987 Feasibility Study for the entire BFRT and the previous 2005 Feasibility Study for the Concord section of the BFRT did not address the anticipated volume of trail users. A 2006 study (completed by the Central Transportation Planning Staff) to extend the BFRT from Sudbury south into Framingham noted an estimate of approximately 250-275 trips per day on the Framingham section.

A trip is defined as a bicyclist or pedestrian passing a given point on the trail. Thus a trail user making a round trip on the trail would count as two trips.

During the study process, THE CONSULTANT referenced several reports outlining methods to estimate trail user volume. The reports examined existing trails and compared actual counts on the trails with population density in the adjacent community. The conclusion was that the higher the adjacent population, the higher the volume of trail users. A trip generation factor (i.e., one daily trip on the trail for every 22 people living near the trail) was determined. This seems quite reasonable given the overwhelming experience on other trails that shows most users of rail trails are nearby residents. Further, experience also shows that these residents use the trail on a frequent and regular basis.

The Consultant also referenced a study that estimated volumes of trail users on three trails: the Norwottuck Trail in western MA, the Burlington Bikeway in Burlington, VT and the Minuteman Bikeway in Arlington, Lexington and Bedford, MA. The study was completed by Alta Planning & Design in 2003 and utilized the method of comparing actual trail counts to population density. To verify the validity of this method of trip estimation, The Consultant used published trail counts for the Minuteman Bikepath and the East Bay Bikepath that stretches from Providence to Bristol, RI and compared them to the trip estimate for the Minuteman Bikepath contained in the Alta Planning study. The results compare favorably.

The Norwottuck Trail is a rail to trail facility similar in length and population densities to the Acton, Concord and Sudbury sections of the BFRT. Using the Norwottuck trip generation rate, the estimate for trips during the spring, summer and fall (SSF) seasons for the Concord section of the BFRT was determined to be approximately 435 on weekends and 165 on weekdays. The total annual number of trips for the Concord section of the BFRT is estimated at approximately 73,000 trips.

The calculations for the volume estimates are contained in the Appendix.

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# Proposed Alignment

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## Trail Alignment

Citizen comments emphasized the desire to construct the trail while minimizing the amount of earth work, soil disturbance, tree removal and clearing. The Trail alignment will generally follow the original railroad track centerline with some minor horizontal shifts to the left or right. These shifts will utilize the existing cleared area to the greatest extent possible. The trail profile was also set to minimize the amount of grading and clearing. Refer to the 25% plans for full details of the trail alignment.

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## Trail Alignment Alternatives – West Concord Station

The original railroad alignment included an at-grade track crossing of the Lowell & Framingham track (now the BFR) and the Fitchburg Railroad (now the MBTA commuter corridor) at the existing West Concord Station. The former railroad corridor north of the active commuter tracks has been converted into a commuter parking lot. A parking lot aisle and row of parking on both sides is oriented in a north-south direction along the alignment of the former rail corridor and also in an east-west direction parallel and adjacent to the active MBTA tracks. The access drive to the Concord Park Assisted Living Center is laid out on an east-west axis and crosses the T commuter lot. Entrance to the parking lot is from Commonwealth Avenue. South of the active commuter tracks, the former railroad corridor has been converted into a pedestrian park (Junction Park) with a brick paved surface, benches, interpretive signs and features.

During the peak weekday commuting hours, trains arrive at the station at approximately 45-minute intervals from 6:26 AM to 8:46 and from 4:48 PM to 7:00 PM. On weekends, trains usually run two to three hours apart. The commuter parking spaces require payment of a nominal parking fee. There are several short-term parking spaces in the commuter lot near the Commonwealth Avenue entrance reserved for West Concord business access. There is no charge for these short-term spaces. In between the weekday peaks and weekend trains; traffic in the commuter parking lots is almost nonexistent save for the short-term spaces near Commonwealth Avenue and minor traffic to the Living Center.

There are several bicycle racks adjacent to the MBTA platform which are utilized year round by bicycle commuters. Bicycle riding on the train platforms is prohibited.

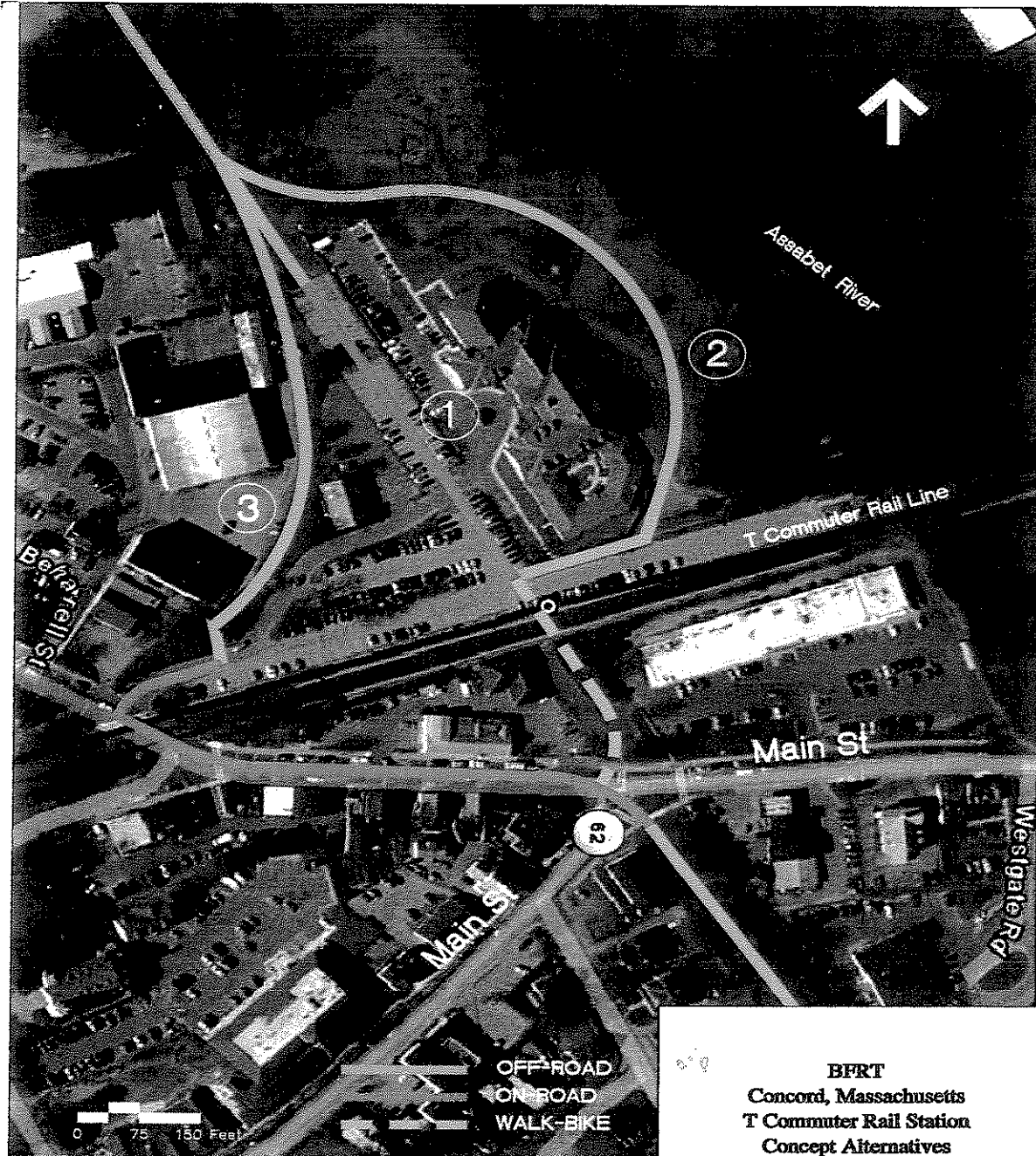
Bicycles are permitted on MBTA trains in all directions during non-peak hours and in non-peak directions during peak hours. Folding bicycles are allowed on MBTA trains at all times.

Three alternates were considered for routing trail through and/or around the West Concord MBTA Commuter Rail Station, as requested by the Advisory Committee (see Figure 2).

- **Alternative 1: Parking Lot and T Pedestrian Crossing** – Route the trail as an “on-road” type facility along the former railroad alignment from the north end of the MBTA station parking lot through the parking lot and Junction Park to the Main Street/Commonwealth Avenue intersection. (See insert on 25% Plans, Sheet 20.) A yellow centerline pavement marking and “sharrow” pavement markings (See insert on 25% Plans, Sheet 20) placed along the center of the MBTA parking lot aisle would delineate the Trail alignment up to the existing MBTA pedestrian at-grade rail crossing. “Walk Bike” signs installed at the crossing and both ends of Junction Park would direct trail users across the MBTA tracks and through Junction Park to the signal at the intersection of Commonwealth Avenue/Main Street. Trail users would utilize the pedestrian phase of the existing signal to cross Main Street/Commonwealth Avenue to rejoin the off-road portion of the trail. The existing MBTA pedestrian crossing would be upgraded with pedestrian gates and flashers.
- **Alternative 2: Off-Road around the Concord Park Assisted Living Center and through Junction Park** – Route the trail as an off-road, shared-use path to the east side of the Concord Park Assisted Living Center building to the MBTA parking lot aisle. See Alternative 2, Figure 2. The trail location would be between the existing stone dust walk and the river. At the parking lot, the trail would then cross the parking lot aisle at the existing pedestrian crossing, continue across the tracks and through Junction Park as a “Walk Bike” facility to the Main Street/Commonwealth Avenue signal similar to Alternate 1. The existing MBTA pedestrian crossing would also be upgraded as per Alternate 1.
- **Alternative 3: On-Road/Off-Road through West Concord** –Route the trail as on off-road, shared-use path along a former track siding on the west side of the parking lot to the parking lot entrance at Commonwealth Avenue (Alternative 3, Figure 2). Plantings and railings would be placed along the trail to encourage users to follow the alignment and discourage “short-cuts” through the MBTA parking lot. At the parking lot entrance, trail users would have two options:

The first option for pedestrians and the less experienced bicyclists is to continue as a “Walk Bike” facility following Commonwealth Avenue on the north sidewalk through the commercial/retail downtown of West Concord to the intersection with Main Street. Trail users would utilize the traffic signal to cross Main Street and rejoin the off-road trail south of the intersection. Additional coordination with Town officials and merchants should be undertaken to verify which side of Commonwealth Avenue is the preferred “Walk Bike” route.

Figure 2 MBTA Alternatives



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The second option allows the more experienced bicyclists to continue along Commonwealth Avenue as on-road bicyclists to the intersection of Main Street. The bicyclist would also utilize the signal to cross Main Street and rejoin the off-road portion of the trail.

Trail blazer signs could be placed through the downtown area to confirm the trail route to those users unfamiliar with the area. A BFRT routing sign and signs emphasizing "Walk Bike-No Sidewalk Riding" and "Road Cyclist follow Sharrows" (symbol) should be placed at each end of the portion through West Concord. "Sharrow" pavement markings placed on Commonwealth Avenue as well as "Share the Road" warning signs on all roadway approaches should be included in the design. The combination of pavement markings and signs are intended to encourage on-road bicyclists to position themselves in the most visible portion of the roadway in accordance with MA traffic laws as well as warn motorists of the potential presence of bicyclists in the roadway. The signs should also discourage sidewalk riding in a business district also as per MA law.

The "sharrow" markings are placed on the right side of existing travel lanes as recommended by the MUTCD. This option does not reduce nor eliminate on-street parking in West Concord.

Additionally, "Walk Bike" and "No Riding on Platform" signs should be placed at Junction Park and the MBTA pedestrian crossing to discourage use of the crossing as the trail route. The Town should continue to work with the MBTA through final design to determine the most appropriate treatment for this area.

### **Other Alternatives for West Concord**

Several other alternatives were given consideration during the design development process, including:

- **Church Street Alternative** – This alternative is similar to Alternative 3 except the trail would be routed from Commonwealth Avenue to Church Street and then to Main Street, bringing trail users to the existing signal. This alternative was eliminated due to the steep grades on Church Street which would make sidewalk accessibility difficult. This route also deflects trail users further from the original railroad corridor resulting in a longer "detour" route and discourages trail users from visiting commercial/retail establishments in West Concord.
- **Assabet River Culvert** – This alternative would route the trail behind the Senior Living Center or MBTA parking lot and under the Assabet River culvert. Although the river levels during portions of the year may be low enough to provide sufficient width through the culvert, construction of the trail would constrict the river floodway and place fill in the river floodplain. Both of these impacts would affect the hydraulics and flood profile of the river, possibly raising flood levels. Additionally, the trail would need to be closed to use during flood periods. For these reasons, this alternative was eliminated from further evaluation.

## Summary of West Concord Alternatives

Town officials and the design team met with officials from the MBTA to discuss alternatives for the trail location at the West Concord Station. The MBTA determined that upgrading the platform crossing to a fully protected pedestrian crossing is not included in their short term capital improvement. The MBTA is initiating an infrastructure improvement program on the Fitchburg commuter corridor and will at that time evaluate options to improve the West Concord Station, which may include pedestrian access. THE CONSULTANT recommends that the Town coordinate with the MBTA during the Fitchburg commuter corridor design process to monitor how pedestrian and bicycle accommodation can be provided at the West Concord Station area.

Given the MBTA's position regarding upgrading the existing pedestrian platform crossing at this time, Alternatives 1 and 2 do not appear to be viable options. Accordingly, and as per the Advisory Committee's direction, the 25% plans were prepared to include Alternative 3 On-Road/Off-Road through West Concord.

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## Alternatives at White Pond

The Bruce Freeman Rail Trail Committee requested consideration of alternate routes for the trail in the vicinity of White Pond to address citizen's comments about potential trail impacts to the pond, in terms of water quality and trespass. The alternatives analysis considered three alternatives to divert the trail from the railroad corridor to on-road bike routes. The three routes, shown in Figure 3, are described as follows:

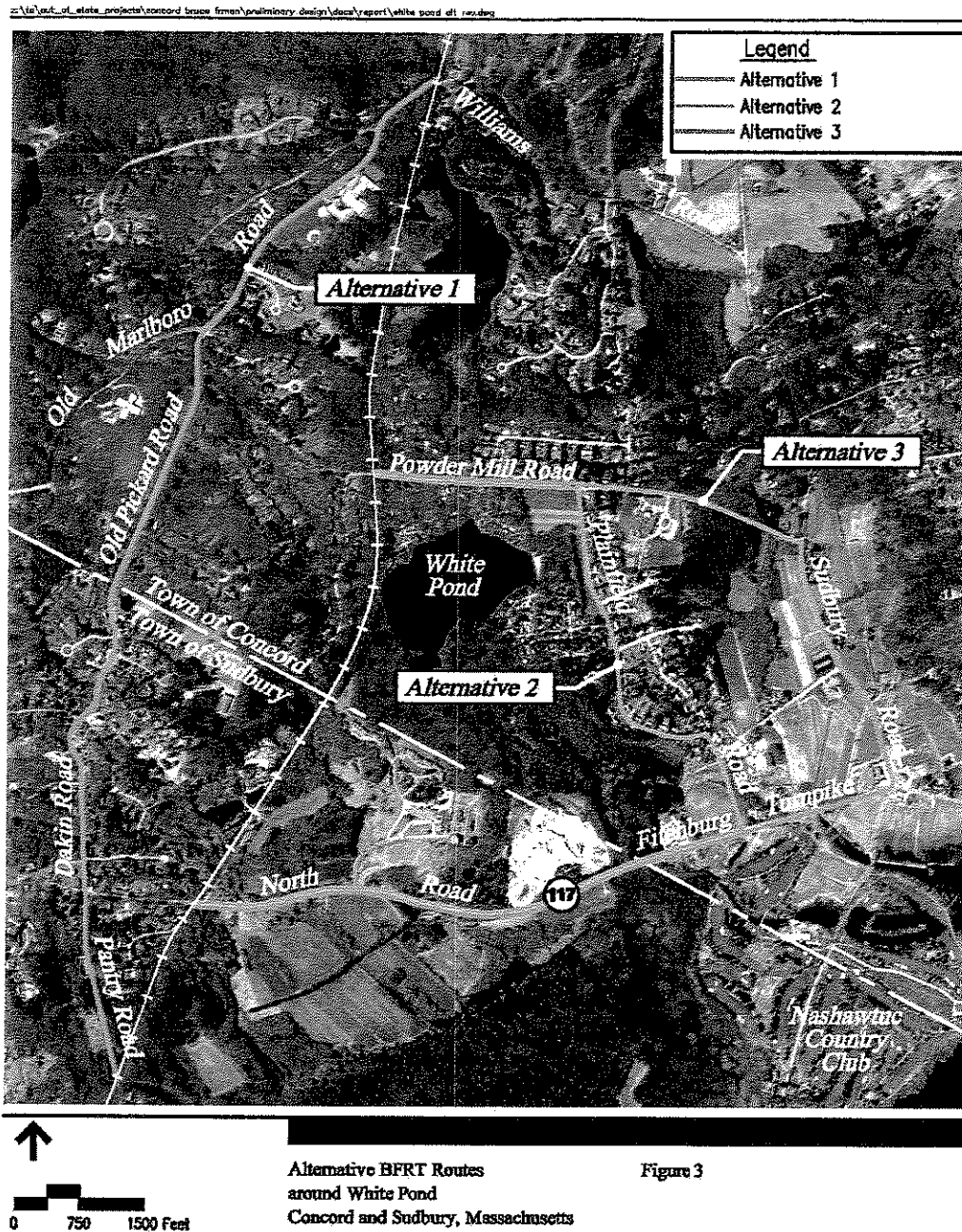
- **Alternative 1** – From the railroad corridor at Williams Road, west to Old Marlboro Road, then south on Old Pickard Road to Dakin Road at the Sudbury town line, continuing south on Dakin Road in Sudbury to North Road (Route 117), and then south on Pantry Road to the railroad corridor.
- **Alternative 2** – From the railroad corridor onto Powder Mill Road, then east to Plainfield Road south on Plainfield Road to Fitchburg Turnpike (Route 117), continuing west on Fitchburg Turnpike into Sudbury, and returning to the railroad corridor.
- **Alternative 3** – From the railroad corridor onto Powder Mill Road, east to Sudbury Road, and continuing south to Fitchburg Turnpike (Route 117), then west on Route 117 into Sudbury and back to the railroad corridor.

The alternatives were analyzed in detail based on criteria including available right-of-way, traffic conditions, connection to local features and construction costs. A field inventory was also undertaken to verify existing conditions such as pavement widths, sight distances, drainage patterns, adjacent land uses and potential conflicts with utility infrastructure. The results of the field reviews and alternative assessment,

as presented to the Advisory Committee, are contained in the Appendix to this report under White Pond Alternatives.

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**Figure 3**  
**Alternative BFRT Routes around White Pond, Concord and Sudbury,**  
**Massachusetts**



**Figure 3**

In summary, each of the alternative routes will require some roadway improvements in the Town of Sudbury, which are not within the Town of Concord's jurisdiction and, therefore, cannot be improved without consent and approval from the Town of Sudbury. The on-road alternatives result in a significant detour from the railroad corridor and circuitous route to connect back into the BFRT spine (especially Alternatives 2 and 3). As a result, the utility as a regional connection diminishes and the experience for corridor uses changes dramatically. All of the on-road alternatives will also require widening of the pavement surface to satisfy minimum criteria for on-road bicycle accommodation. This widening will require acquisition of private property (linear strip takings) and the relocation for reconstruction of utilities including poles and overhead lines may be necessary. The widening will result in impacts to wetlands that border these roadways including a state wildlife management area.

The on-road alternatives will also result in a significant detour from the railroad corridor and circuitous route to connect back into the BFRT spine (especially Alternatives 2 and 3).

As a result of this analysis and per the direction of the Advisory Committee, the 25% plans have been developed with the trail alignment along the rail bed corridor.

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## Trail/Roadway Crossings

The Concord section of the BFRT includes four (4) at-grade roadway crossings. The specific crossings include Commonwealth Avenue at the MCI facility, Commonwealth Avenue/Main Street in West Concord center, Old Marlboro Road and Williams Road. There are two crossings of minor driveways along the railroad corridor south of Williams Road and one farm path crossing south of Old Marlboro Road.

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## Roadway Crossings – General Approach

Overall, the crossing designs and alignments encourage both motorists and trail users to conform to Commonwealth of Massachusetts traffic laws regarding motor vehicles, bicycles and pedestrians.

The MassHighway Project Development & Design Guide notes that traffic signals should be considered where trails cross roadways with traffic volumes greater than 10,000 vehicles per day. The Commonwealth Avenue/Main Street crossing in West Concord center is the only trail crossing with traffic volumes in that range and is currently signalized. Additionally, field review of the Concord roadway crossings found that existing sight distances on both the trail and roadways approaches exceed the design criteria with the exception of one direction on

Williams Road. Conditions at the proposed trail crossings do not warrant the construction of additional traffic signals.

At the intersections of the trail and a public roadway, the right-of-way priority is assigned to the vehicles in the roadway with a STOP condition on the trail approaches. Crosswalks will be marked on the roadway for trail crossings. The trail approach alignments will place trail users in the path of the crosswalk where motorists normally expect them to be. The trail approaches in the unpaved trail sections will be paved to reduce wear from stopping and turning bicycles and maintenance vehicles. Appropriate warning signs and markings are proposed on both the trail and roadway approaches to alert both motorist and the trail users of the crossing. The crossing design will include construction of small "splitter-island" and bollard on the trail approaches to introduce a "traffic calming" effect to both trail users and motorists that further reinforces the presence of the crossing. The island and bollard will discourage unauthorized vehicle access while permitting access for law enforcement/emergency response and maintenance vehicles. We have no reason to anticipate that trail users or motorists will be suddenly confronted with unexpected conflicts that would make it impossible to respond appropriately.

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### **Commonwealth Avenue/MCI**

The former rail bed crosses just south of the MCI Concord facility at a skew angle of approximately 60 degrees. Traffic volumes on the roadway range from 7500 vehicles per day (vpd) on a weekday to 5300 vpd on a weekend day. The MCI Concord facility also utilizes part of the former Railroad right-of-way as an unpaved access road to the rear of the prison. Research conducted for the previous Feasibility Study did not find any interagency use agreements between the MA Corrections Department and EOTC for use of the right-of-way. Sight distances along both approaches of Commonwealth Avenue exceed the project criteria.

The trail alignment will be skewed to provide a shorter roadway crossing distance. A marked crosswalk will be installed and a splitter island constructed on the trail approaches. Signs on both trail and roadway approaches will be installed to alert motorists and trail users of the crossing.

Town officials met with MCI Concord staff to coordinate the trail design with the operations of the prison. The prison staff listed several items including:

- The trail design should provide for MCI vehicle access from Commonwealth Avenue to the rear of the prison.
- Install bicycle railing along the trail to discourage trespassing onto prison grounds from the trail.
- Install downcast lighting along the trail to illuminate the trail. The intention is that prison guards can monitor anyone approaching the prison during hours of darkness.

- Install a trail gate on the trail at the MBTA parking lot such that the trail can be closed during prison emergencies.

Pending Committee review of the 25% plans, we recommend further coordination with MCI Concord staff to confirm and finalize the location of the trail parking on the north side of Commonwealth Avenue and MCI Concord staff vehicle access along the trail.

As previously noted, MassHighway is undertaking design for reconstruction of the Rotary. It is anticipated that the trail alignment in this area may be revised as part of the design of the Route 2 Rotary reconstruction.

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### **Commonwealth Avenue/Main Street**

This intersection is currently signalized and includes a pedestrian phase. Traffic volumes are approximately 11,000 vpd. The intersection marks the transition point from an off-road shared-use trail to a pedestrian/walk-bike route or an on-road bicycle route through West Concord center as outlined in the Trail Alignment Alternatives section of this report. Movements of vehicles, pedestrians and bicycles through this intersection are controlled by the signal in accordance with MA law. The trail approaches and signal will be modified to accommodate pedestrian and walk-bike users and on-road bicyclists.

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### **Old Marlboro Road**

The former rail bed crosses Old Marlboro Road south of the West Concord center at a skew angle approximately 350 feet southwest from the intersection with Cottage Street. Traffic volumes are approximately 6,500 vpd on weekday and 3,600 vpd on a weekend day. The trail will be aligned to move the crossing further southwest from Cottage Street and to provide a less skewed trail approach to the roadway. Vegetation clearing limits within the roadway right-of-way will be marked to maintain sight distances in accordance with the design criteria. Access for emergency vehicles will be included.

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### **Williams Road**

The former rail bed crosses Williams Road approximately 50 feet from a "T" intersection with Old Marlboro Road. Traffic volumes are approximately 1,600 vpd on a weekday and 850 vpd on a weekend day. The trail crossing of Williams Road will be shifted from the track center line closer to the "T" intersection with Old Marlboro Road. This alignment places the crossing within the existing crosswalk at the corner radius of the intersection where motorists would normally expect a crosswalk. This alignment also places the trail user in a location that maximizes the sight distances of trail users looking south and north along Old Marlboro Road such

that they can judge the approach of vehicles turning at speed from Old Marlboro Road onto Williams Road.

The crossing sight distance for the northbound trail user looking east on Williams Road is approximately 260 feet and thus exceeds the vehicle stopping sight distance (205 feet for 30 mph on 3% downgrade). The FDOT tables for crossing sight distance recommend 400 feet for bicycles and 625 feet for pedestrians based on a crossing width of 40 feet and an approach speed of 30 mph. Since vehicles on Williams Road will be approaching a STOP condition at Old Marlboro Road, the crossing sight distances listed in the FDOT are most likely more than actually needed for trail users to cross the roadway. The sight distance along Williams Road could be increased with removal of vegetation. The project design includes obtaining a permanent easement for vegetation clearing within the sight distance triangle to increase the crossing sight distance. Advance warning signs and pavement markings alerting motorists to the trail crossing should be placed on Williams Road.

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### **Driveway/Farm Path Crossings**

As noted by the AASHTO Guidelines, assigning right-of-way priority at trail/roadway intersections should be done on a case by case basis. Assigning the right-of-way to the trail recognizes that some trail users may have a very low delay tolerance, a strong desire to maintain momentum and in the case of children, a limited knowledge of traffic rules. Automatically assigning the right-of-way priority to the motor vehicle approach at a crossing that has very infrequent vehicle traffic would encourage trail users to ignore the STOP sign on the trail. Requiring the crossing motor vehicles to stop places the responsibility to comply with traffic rules with an adult vehicle operator.

From field review observations, these crossings do not appear to be subject to heavy volumes of vehicle traffic. For the trail construction, it is proposed to assign the right-of-way priority to the trail with STOP signs and trail crossing signs on the driveway/farm path approaches. Intersection warning signs will be placed on the trail approaches.

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### **Parking**

Shared-use trails have proven to be an attraction even for users who must drive to reach them. Planned parking facilities should be established along the trail to accommodate these users and to allay neighborhood concerns regarding random on-street parking. Parking and access to the path will need to be compliant with ADA regulations. As part of this project, the Advisory Committee has directed parking facilities at the following locations:

- A new parking lot on the north side of Commonwealth Avenue adjacent to the trail.
- A new parking lot on the north end of the existing MBTA commuter rail parking lot. The trail parking should be designated as trail parking as opposed to commuter parking.
- A single HP parking space off of Old Marlboro Road at the entrance to the Rifle Range Conservation area opposite Williams Road.

## Pavement Markings and Signage

Standard regulatory and warning signs are incorporated into the trail design to alert trail users to potential conflicts and to convey regulatory messages. Signing should encourage compliance with standard traffic operation "rules of the road" including:

- Bicycles yield to pedestrians
- Keeping to the right side of the trail except to pass.
- Give an audible warning before passing
- When passing, yield to slower and on-coming traffic
- Travel in a consistent and predictable manner.
- Don't block the trail. Groups should use no more than half the trail.
- When stopping, move off the trail.

In general, uniform application of standard traffic signs, modified for use on trails as described in the MUTCD, should be utilized to the greatest extent possible to convey the rules of the road. Over signing is not recommended as too many signs decrease the sign's effectiveness, clutter the landscape and present sign posts as fixed object hazards themselves.

It is recommended that signs noting general trail rules, street names and guide signs indicating direction to destinations and points of interest should also be included at trail access points. References to model trail rule ordinances are listed in the Appendix – Maintenance and Operation.

It is also recommended that Concord coordinate with the other BFRT communities to develop BFRT logo signs that can serve as trail blazer signs.

To provide redundancy in case signs are vandalized or removed, it is recommended that pavement markings noting "ROAD XING" be applied on the paved trail approaches to road crossings.